

# **Spot Safety Project Evaluation**

Project Log # 200703105

Spot Safety Project # 10-01-209

**Spot Safety Project Evaluation of the Traffic Signal Installation  
At the Intersection of SR 1009 (Monroe Rd) and  
Gandor Cove Lane / Family Dollar Corporate Offices  
Mecklenburg County, City of Charlotte**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Traffic Engineering and Safety Systems Branch  
North Carolina Department of Transportation

**Principal Investigator**

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Jason B. Schronce

11-20-2007  
Date

Traffic Safety Project Engineer

## ***Spot Safety Project Evaluation Documentation***

### **Subject Location**

Evaluation of Spot Safety Project Number 10-01-209 – The Intersection of SR 1009 (Monroe Rd) and Gandor Cove Lane (Drake Apartments) / Family Dollar Corporate Office Entrance in the City of Charlotte, Mecklenburg County.

### **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of a multi-phase, actuated traffic signal. SR 1009 (Monroe Rd) is a high volume, five lane, curb-and guttered roadway with a 45 mph speed limit. Entrance # 3 of Family Dollar intersects Monroe Road across from Gandor Cove Lane, which serves the Drake Apartments. The Family Dollar entrance (#2) immediately north of the proposed signalized intersection will be closed as conditions of the traffic signal installation agreement. The project also provided for dedicated left turn lanes on SR 1009 constructed from the center-turn lane approaching the new signal.

The original statement of problem was the insufficient gaps entering the high volume roadway resulting in frontal impact collisions. The intersection met volume warrant 3B.

The initial crash analysis was completed from January 1, 1998 to January 1, 2001 with twenty (20) reported crashes, eleven (11) of which were deemed correctable by the signal installation. The final completion date for the improvement at the subject intersection was on November 29, 2002 with a total cost of \$40,000.00.

### **Naive Before and After Analysis**

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from October 1, 2002 to January 31, 2003. The before period consisted of reported crashes from August 1, 1998 through September 30, 2002 (4 years and 2 months) and the after period consisted of reported crashes from February 1, 2003 through March 31, 2007 (4 years and 2 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within the strip on SR 1009 from MP 0.68 (150 feet south of Entrance # 4) to MP 0.962 (150 feet north of Entrance # 1 - Truck). *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Frontal Impact Target crashes were designated at all the Family Dollar entrances because of the ability by motorists to access the after period signal within the parking lot connections.

<u>Treatment Information</u>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	49	43	- 12.24 %
Total Severity Index	4.51	3.58	- 20.62 %
Target Crashes	17	8	- 52.94 %
Target Crash Severity Index	3.18	5.63	77.04 %
Volume	33,650	42,070	25.02 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	0	- 100.00 %
Class B injury Crashes	5	2	- 60.00 %
Class C Injury Crashes	8	13	62.5 %
Total Injury Crashes	14	15	7.14 %

The naive before and after analysis at the treatment location resulted in a 12 percent decrease in Total Crashes, a 53 percent decrease in Target Crashes, and a 21 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

## Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 12 percent decrease in Total Crashes and a 53 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, in the before period frontal impact crash patterns existed at Family Dollar Entrances #2, 3, and 4. After the signal installation and removal of Entrance #2, the target crashes involving turning motorists and SR 1009 vehicles reduced from 13 to 7. It appears as if the majority of left turning motorists are utilizing the new signal for their entry onto Monroe Road.

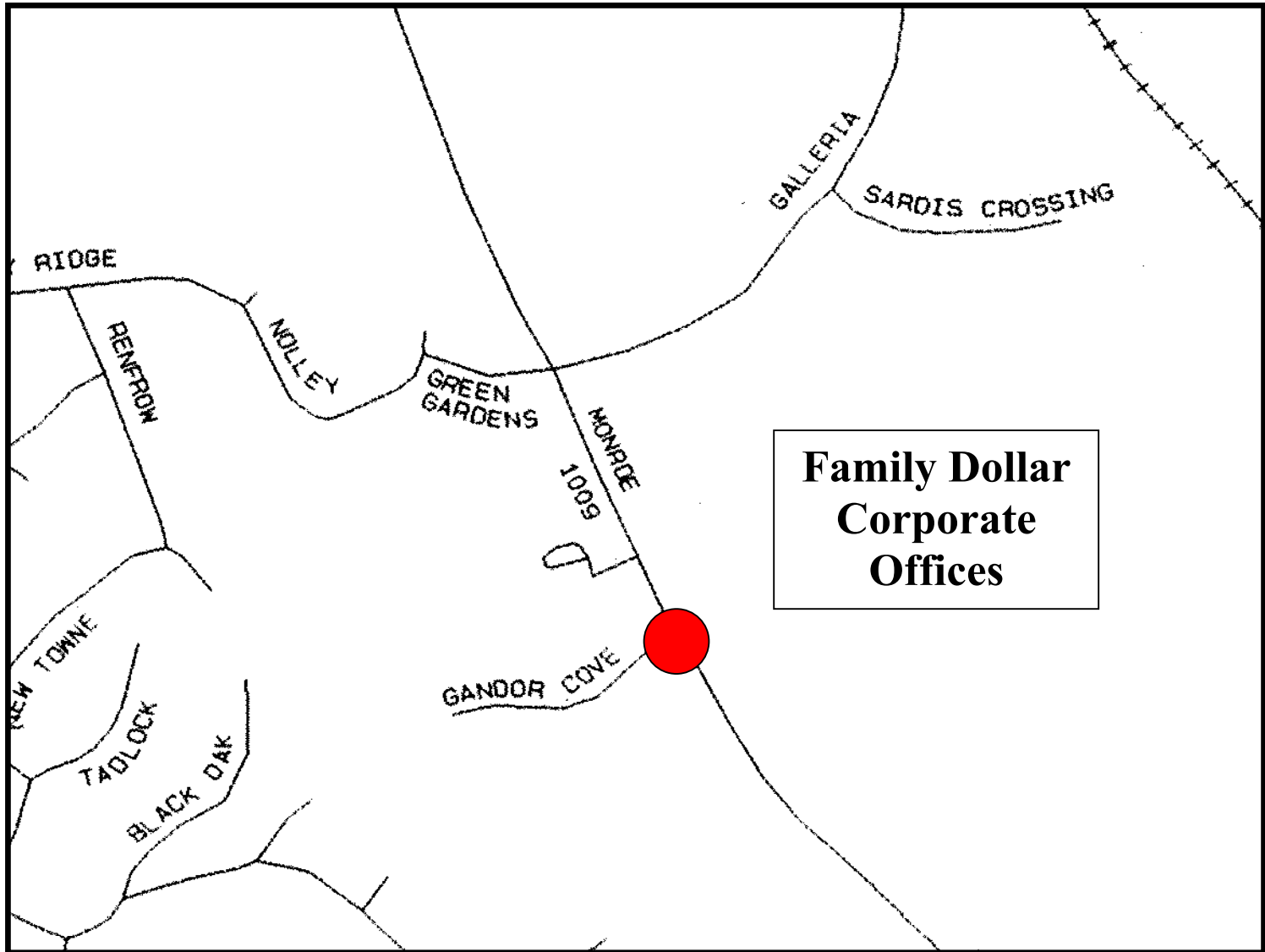
There was a significant increase in Rear-End Crashes on SR 1009 along the segment during the analysis (from 8 to 26). Rear-End Crashes approaching the new signal intersection of Gandor Cove Lane increased from 3 in the before period to 18 in the after period. The gentle curvature of the roadway and steady high volumes are contributing factors to this crash pattern. The volume increase of 25 percent also plays a major roll in the analysis of the developing Rear-End Crash pattern.

The calculated benefit to cost ratio for this project is 13.0 considering total crashes. The benefit to cost ratio considering only target crashes is 0.93. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the new signalized intersection, along with photos of each of the remaining Family Dollar entrances along the strip.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of segment.

**Location Map**  
**Mecklenburg County, City of Charlotte**  
**Evaluation of Spot Safety Project # 10-01-209**



**Treatment Location: SR 1009 (Monroe Rd) at Gandor Cove Lane / Family Dollar Entrances**

## SS# 10-01-209 Aerial Map





## TREATMENT SITE PHOTOS TAKEN 10/17/2007



Traveling Northwest on SR 1009 (Monroe Rd) – Entrance 4 in view



Traveling Northwest on SR 1009 (Monroe Rd) – Main Entrance Signal



Traveling Northwest on SR 1009 – Entrance 1, Truck Entrance



Traveling Southeast on SR 1009 (Monroe Rd) – at Entrance 1, Truck Entrance





Traveling Southeast on SR 1009 (Monroe Rd) at Gandor Cove Lane



Traveling Southeast on SR 1009 (Monroe Rd) at Entrance 4



Traveling East on Gandor Cove Lane (Drake Apartments)



Traveling West on Main Entrance to Family Dollar (at Signal)





South Entrance (# 4) to Family Dollar off Monroe Road



Truck Entrance (# 1) to Family Dollar off Monroe Road

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1009 at Gamdor Cove Ln.  
COUNTY: Mecklenburg  
FILE NO.: SS 10-01-209

BY: JBS  
DATE: 11/19/2007  
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$40,000	10	0.149	\$5,961
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$40,000	10	0.149	\$5,961
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$9,061
TOTAL COST OF PROJECT=	\$40,000

## COMPREHENSIVE COST REDUCTION:

### ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.17	1	0.24	13	3.12	35	8.39	\$208,753
AFTER	4.17	0	0.00	15	3.60	28	6.71	\$90,935

Annual Benefits from Crash Cost Savings \$117,818

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$108,757

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 13.00

TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - 13.00

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1009 at Gamdor Cove  
COUNTY: Mecklenburg  
FILE NO.: SS 10-01-209

BY: JBS  
DATE: 11/19/2007  
NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$40,000	10	0.149	\$5,961
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$40,000	10	0.149	\$5,961
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TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.17	0	0.00	5	1.20	12	2.88	\$32,806
AFTER	4.17	0	0.00	5	1.20	3	0.72	\$24,388

Annual Benefits from Crash Cost Savings \$8,417

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$644)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.93

TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - 0.93



SS# 10-01-209  
Mecklenburg County  
Before Period  
8/1/98 - 9/30/02

End Study  
MP 0.962

Family Dollar  
North Building

Family Dollar  
South Building

Gander Cove Lane  
Drake Apartments

**LEGEND**

MOVING VEHICLE

PEDESTRIAN

PARKED VEHICLE

PARKING VEHICLE

FIXED OBJECT

HEAD ON

REAR END

RAN OFF ROAD

ANGLE

TURNING

BACKING

SIDESWIPE

OUT OF CONTROL

INJURY

FATALITY

9 MPH OR LESS

10 MPH TO 19

20 MPH TO 29

30 MPH TO 39

40 MPH TO 49

50 MPH TO 59

60 MPH TO 69

70 AND UP

SPEED UNKNOWN

P PEDESTRIAN

T TRAIN

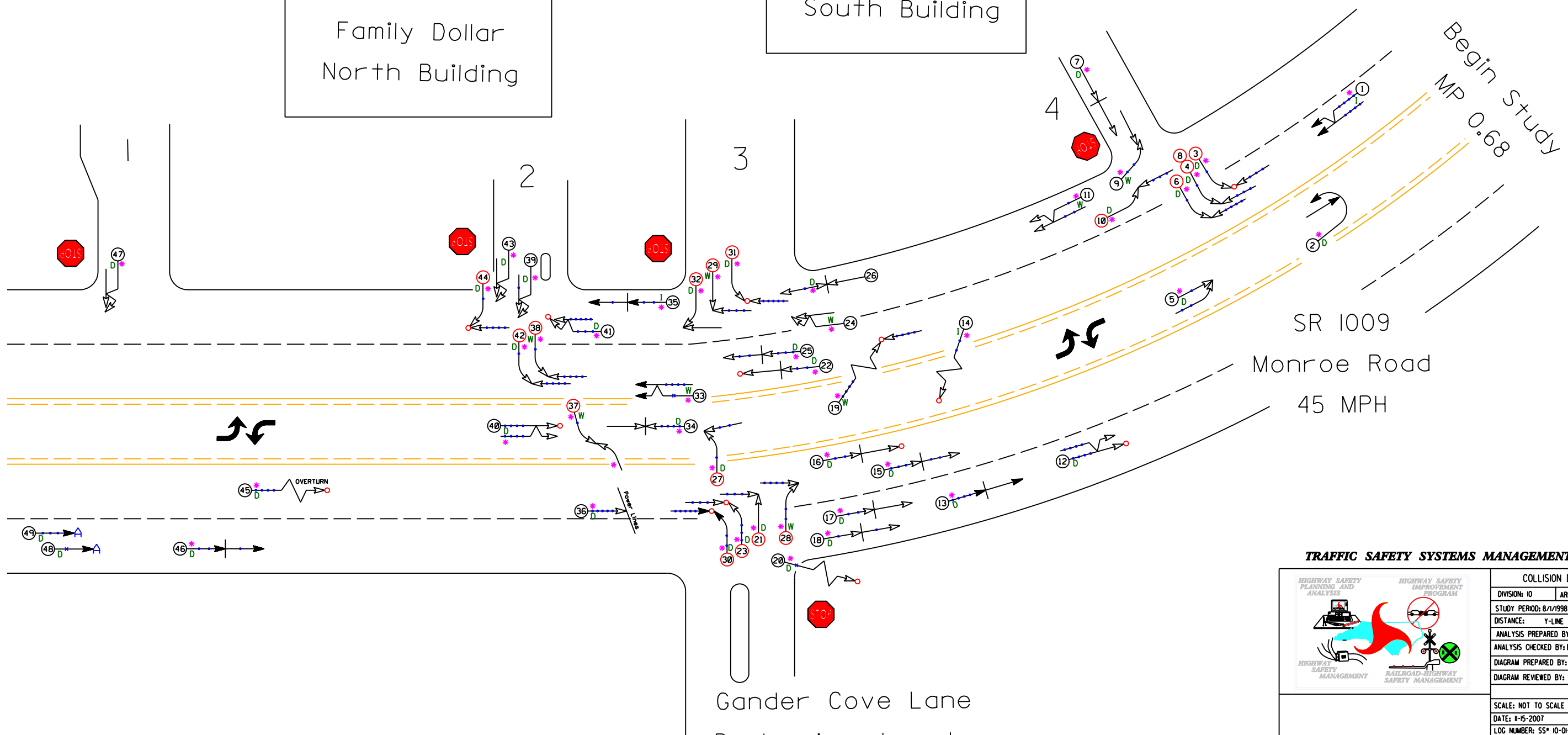
• DRIVER AT FAULT

D DRY

W WET

I ICY OR SNOWY

O OILY



⊕ Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

HIGHWAY SAFETY PLANNING AND ANALYSIS

HIGHWAY SAFETY IMPROVEMENT PROGRAM

COLLISION DIAGRAM

DIVISION: 10

AREA: 2

STUDY PERIOD: 8/1/1998 TO 9/30/2002

DISTANCE: Y-LINE = 150FT

ANALYSIS PREPARED BY: JBS

ANALYSIS CHECKED BY: BR

DIAGRAM PREPARED BY: JBS

DIAGRAM REVIEWED BY: ST

SCALE: NOT TO SCALE

DATE: 11-15-2007

LOG NUMBER: SS\* 10-01-209

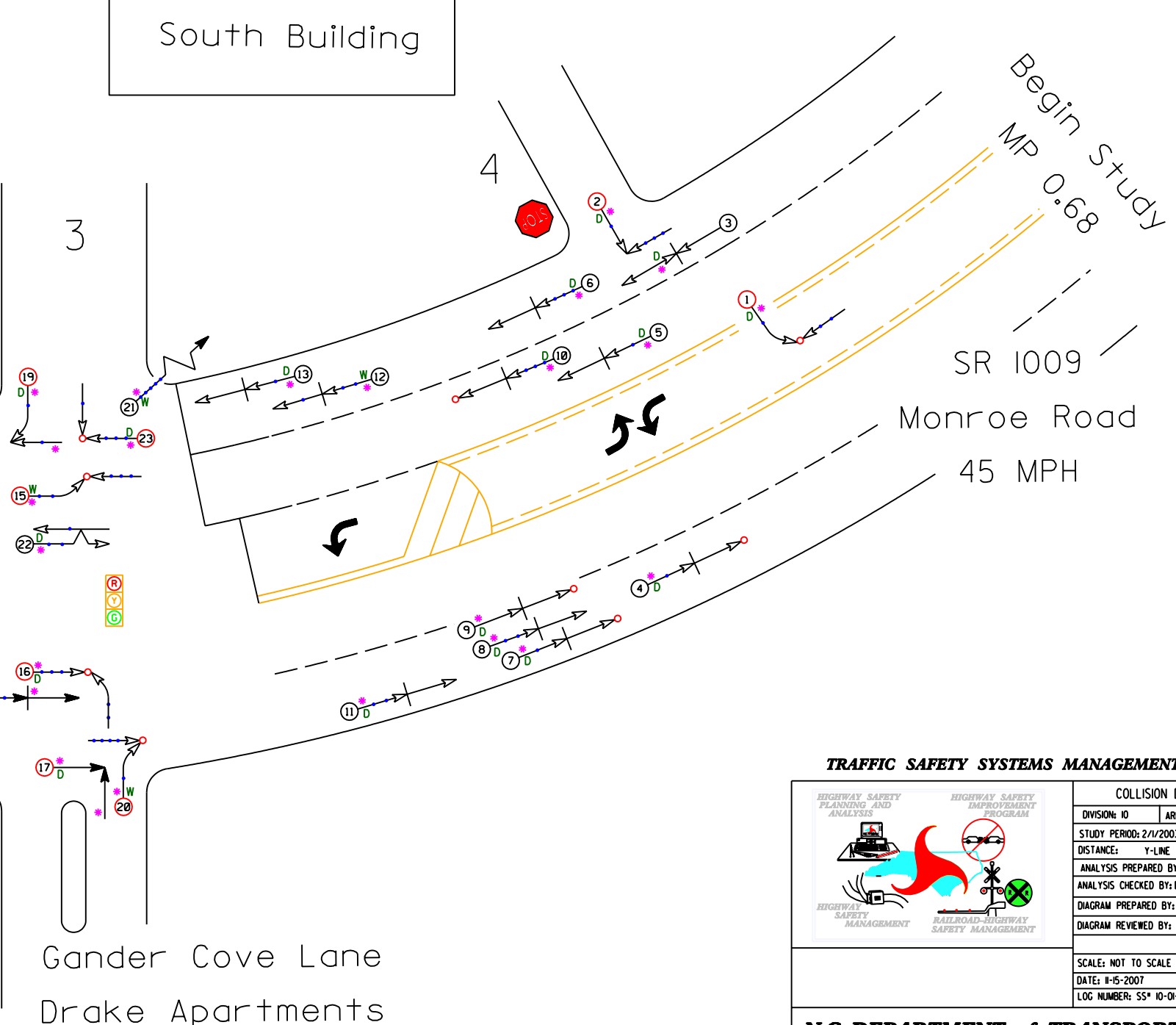
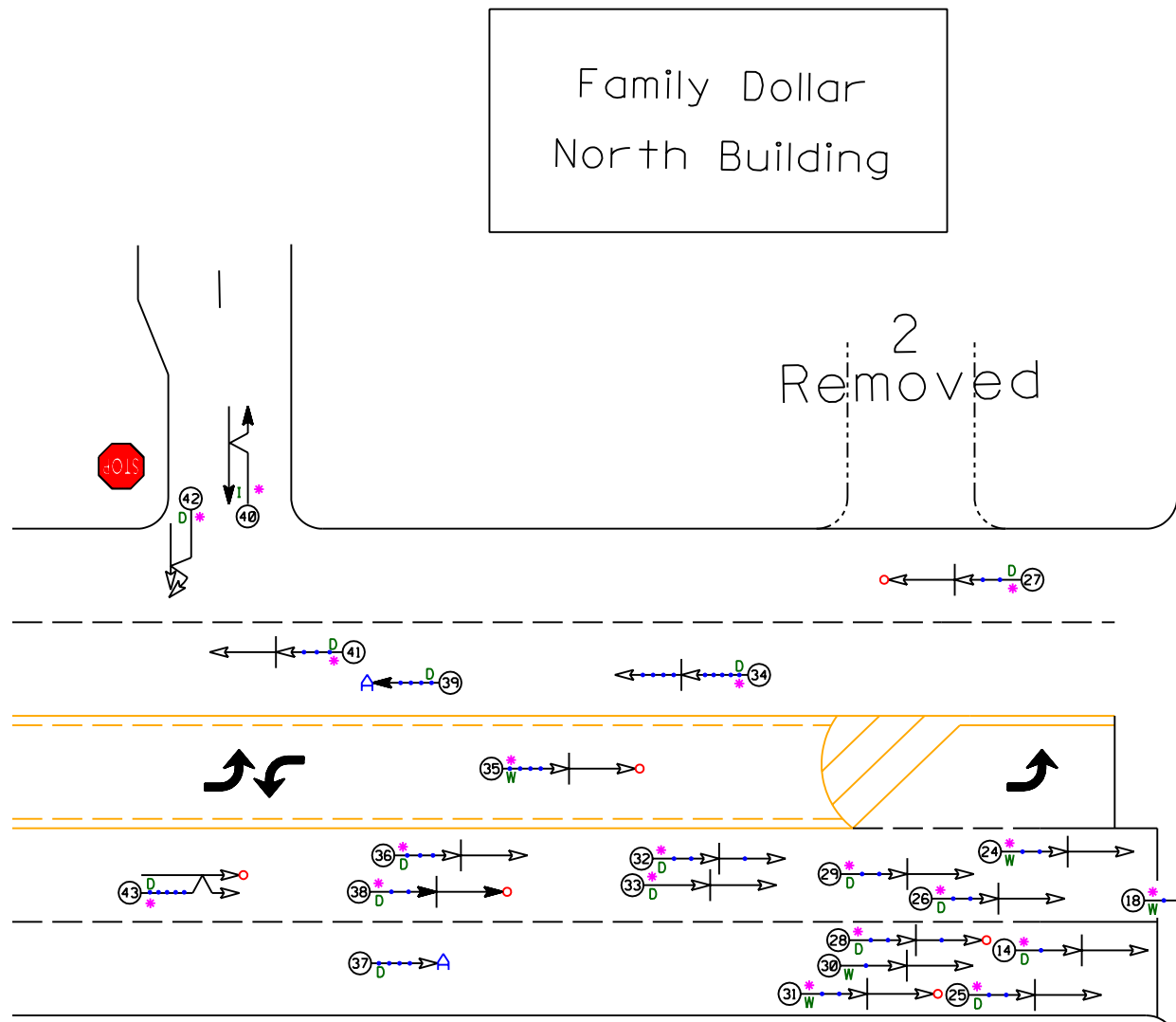
**N.C. DEPARTMENT of TRANSPORTATION**

**DIVISION of HIGHWAYS**

**TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH**

SS# 10-01-209  
Mecklenburg County  
After Period  
2/1/03 - 3/31/07

End Study  
MP 0.962



⊕ Target Crashes

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

COLLISION DIAGRAM	
DIVISION: 10	AREA: 2
STUDY PERIOD: 2/1/2003 TO 3/31/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 11-15-2007	
LOG NUMBER: SS# 10-01-209	

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**